

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Hideyasu MATSUMURA et al. **Confirmation No.: 6325**
Group Art Unit: 1796
Serial No. : 10/541,391
Examiner: Winkler, Melissa A
Filed : July 1, 2005
For :EXPANDABLE BEADS OF STYRENE-MODIFIED LINEARLOW-DENSITY
POLYETHYLENE-BASED RESIN, PRODUCTION METHOD THEREFOR,
PRE-EXPANDED BEADS AND EXPANDED MOLDED ARTICLE

REPLY BRIEF UNDER 37 C.F.R. § 41.41(a)(1)

Commissioner for Patents
U.S. Patent and Trademark Office
Customer Service Window, Mail Stop Appeal Brief - Patents
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

This Reply Brief is in response to the Examiner's Answer mailed December 11, 2008, the period for reply extending until February 11, 2009.

In the Examiner's Answer all grounds of rejection set forth in the final rejection are maintained.

Appellants note that the Examiner's Answer does not sufficiently address several of Appellants' arguments as to why the rejections are without merit, and misrepresents some of the facts. These deficiencies have prompted the present Reply Brief.

Appellants also note that this Reply Brief is being filed under 37 C.F.R. § 41.41(a)(1) and is directed to the arguments presented in the Examiner's Answer, and therefore must be entered unless the final rejection is withdrawn in response to the instant Reply Brief.

In order to avoid repetition, the following response to the Examiner's arguments in the Examiner's Answer will be limited to issues which are important enough to warrant a further comment in Appellants' opinion. Accordingly, Appellants' silence with respect to any allegations set forth in the Examiner's Answer which are not specifically addressed below should by no means be construed as Appellants' admission that these allegations are of any merit.

REPLY

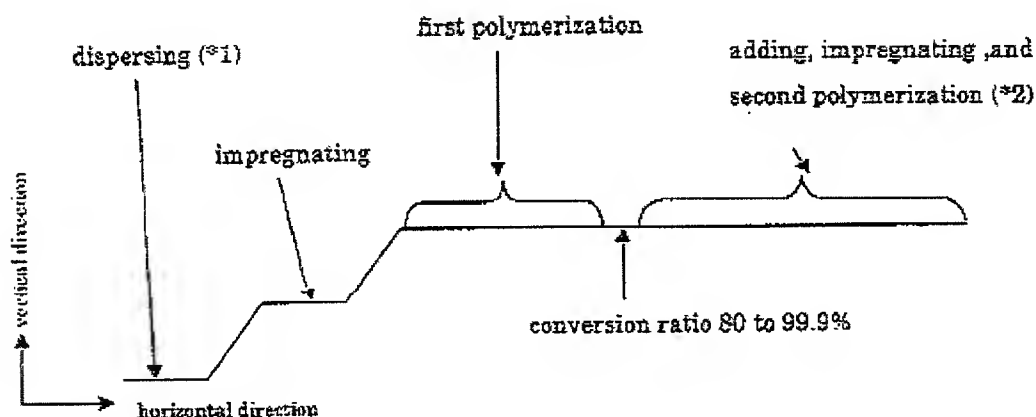
1. As an initial matter, Appellants note that in the last paragraph of page 2 of the Examiner's Answer it essentially is alleged that the summary of the claimed subject matter section contained in the Appeal Brief filed September 23, 2008 is deficient because it does not mention the dependent claims which have been argued separately, as allegedly required by 37 CFR 41.37(c)(1)(v).

Appellants respectfully disagree with the Examiner in this regard. Specifically, it is pointed out that 37 CFR 41.37(c)(1)(v) refers to dependent claims which have been argued separately only in the context of claims which contain means plus function and step plus function language and 35 U.S.C. 112, sixth paragraph. Since the present separately argued dependent claims do not contain means plus function or step plus function language they are not required by 37 CFR 41.37(c)(1)(v) to be mentioned in the summary of the claimed subject matter section of the Appeal Brief.

2. Before addressing specific allegations in the Examiner's Answer it is deemed expedient to briefly illustrate the differences between the method of present independent claim 1 and the methods disclosed in the two documents which are relied on in all of the

rejections of record, i.e., Takamasa et al. (hereafter "TAKAMASA") and Wicher et al., U.S. Patent No. 6,608,150 (hereafter "WICHER").

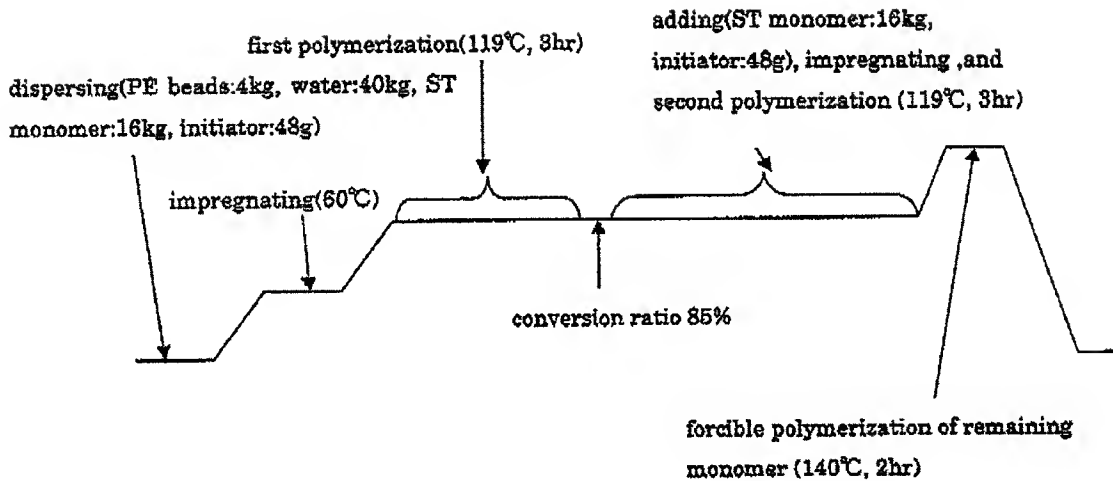
Specifically, in a temperature-time variation graph, the method of claim 1 can be illustrated as follows (for the case where the temperatures in the first polymerization and the second polymerization are the same):



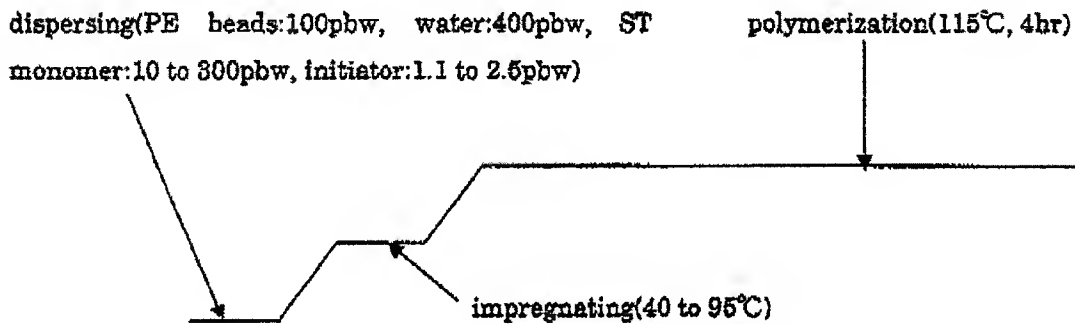
(*1) PE-based beads:100pbw
 1st ST-based monomer:30 to 300pbw
 initiator:0.1 to 0.9pbw/1st ST-based monomer 100pbw

(*2) 2nd ST monomer:total amount of 1st and 2nd ST monomer
 is more than 300pbw and not more than 1000pbw
 initiator:0.1 to 0.9pbw/1st ST based monomer 100pbw

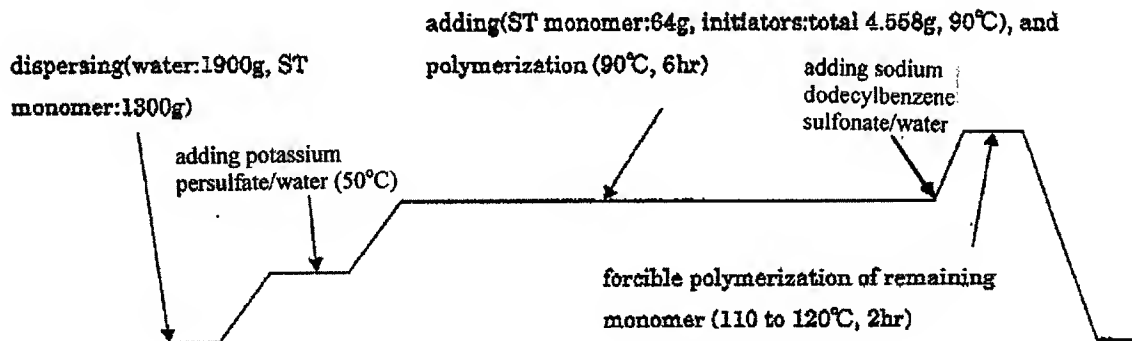
For example, the specific method described in Example 1 of the present specification (pages 26-28) can be represented as follows:



In comparison, the temperature-time variation described in the Examples of TAKAMASA can be represented as follows:



Further, the temperature-time variation described in the Example 4 of WICHER specifically relied on by the Examiner can be represented as follows:



A comparison of the above graphs makes it evident that (a) the methods of TAKAMASA and WICHER differ fundamentally in several respects, and (b) even a combination of the methods of TAKAMASA and WICHER would not result in the claimed method.

Specifically, the methods of TAKAMASA and WICHER differ, *inter alia*, in that the starting materials of the method of TAKAMASA are (preformed polyethylene) resin beads and polymerizable vinylaromatic monomer (e.g., styrene), whereas the only starting material of the method of WICHER is a polymerizable monomer such as styrene and the like. Due to this difference, the method of WICHER differs from the method of TAKAMASA also in that it does not include an impregnation step (there is no solid that can be impregnated with the polymerizable monomer).

Further, the polymerization of TAKAMASA is carried out at a single temperature and with a single catalyst, whereas the polymerization of WICHER is carried out at two different temperatures and with (at least) two different catalysts of different thermal stability.

Additionally, TAKAMASA requires the use of at least 1.0 parts by weight of polymerization initiator per hundred parts by weight of vinylaromatic monomer, whereas in all of the Examples of WICHER the total amount of the mixture of polymerization initiators employed is significantly lower, i.e., less than 0.5 parts by weight per hundred part by weight of styrene.

Even further, the product of the method of TAKAMASA are polyethylene beads which have polystyrene incorporated therein, whereas the product of the method of

WICHER are (homogeneous) beads made of only one kind of polymer such as, e.g., polystyrene beads.

Appellants submit that in view of at least all of the fundamental differences between the methods of TAKAMASA and WICHER which are set forth above there is no apparent reason for one of ordinary skill in the art to combine the teachings of these documents, let alone in the manner contemplated by the Examiner.

It further is to be pointed out that neither the method of TAKAMASA nor the method of WICHER includes the polymerization of a polymerizable monomer followed by the addition of additional monomer and a second polymerization and for this reason alone, even a combination of the methods of TAKAMASA and WICHER in the way contemplated by the Examiner would not result in the method recited in present claim 1.

Additionally, TAKAMASA fails to teach or suggest using 0.1 to 0.9 parts by weight of polymerization initiator relative to 100 parts by weight of styrene-based monomer as recited in present claim 1. TAKAMASA limits the amount of polymerization initiator to 1.0 to 3.0 (and preferably 1.1 to 2.0) parts by weight of polymerization initiator relative to 100 parts by weight of vinylaromatic monomer and indicates that this concentration is necessary to obtain a favorable distribution, molecular weight distribution and size of the polymerized monomer particles inside the polyethylene beads (see, e.g., page 2, fifth paragraph and page 3, next-to-last paragraph of the machine translation of TAKAMASA).

TAKAMASA further fails to teach or suggest using more than 300 parts by weight of styrene-based monomer per 100 parts by weight of non-crosslinked linear low density polyethylene based resin beads, as recited in present claim 1. On the contrary,

TAKAMASA explicitly teaches that if more than 300 parts by weight of vinylaromatic monomer are used per 100 parts by weight of polyethylene resin beads the monomer is not completely absorbed by the resin beads and polymerizes independently, which is not desirable (as explained, for example, at pages 4 and 5 of the present specification, this problem has been overcome by the method of the present invention). Accordingly, TAKAMASA teaches a preferred upper limit of vinylaromatic monomer of 200 parts by weight of vinylaromatic monomer per 100 parts by weight of polyethylene resin beads (see, e.g., page 2, second paragraph of the machine translation of TAKAMASA).

WICHER apparently is unable to cure this deficiency of TAKAMASA because this document does not even disclose any polyethylene (or other polymer) beads which are to be impregnated with a monomer which is different from the monomer for the beads and is to be polymerized inside the beads.

For at least all of the foregoing reasons, TAKAMASA as modified by the teaching of WICHER (in any manner) would not result in the claimed subject matter.

3. Turning now to the Examiner's response to the arguments set forth in the Appeal Brief, Appellants note that, e.g., in the paragraph bridging pages 13 and 14 and at page 14, first full paragraph of the Examiner's Answer the Examiner maintains the position that Example 4 of WICHER discloses a two-step polymerization process wherein a first polymerization of styrene monomer at a first, lower temperature is followed by the addition of styrene monomer and a second polymerization of the styrene monomer at a second, higher temperature.

Appellants again respectfully (and strongly) disagree with the Examiner in this regard. In particular, it is apparent that the polymerizations of styrene monomer at different temperatures which are described in Example 4 of WICHER are conducted without any addition of styrene monomer between these polymerizations. This is at least implicitly conceded at the beginning of the last paragraph of page 14 of the Examiner's Answer where it is stated that "the polymerization initiators are present from the beginning of the polymerization". This can only mean that the polymerization of WICHER commenced only after the entire employed styrene monomer was present, because the second portion of the styrene monomer was added together with the polymerization initiators.

Specifically, according to Example 4 of WICHER 1300 g of styrene monomer was suspended in 1900 g of deionized water containing 10.25 g of tricalcium phosphate (as suspension stabilizer, see col. 7, lines 11-13 of WICHER). The resultant suspension was heated to 50°C and 0.021 g of potassium persulfate in 50 g of deionized water was added, whereafter the resultant blend was heated to 90°C. At this temperature, i.e., before the polymerization of the styrene monomer inside the styrene droplets, three organic polymerization initiators were added to the suspension in the form of a solution in styrene monomer (64 g, less than 5 % of the suspended styrene monomer already present). Apparently, only after the polymerization initiators had been added, the actual polymerization of the styrene monomer (at two different temperatures, i.e., six hours at 90°C and two hours at 110° to 112°C) could take place.

In other words, once the actual polymerization of the styrene monomer was initiated by adding the polymerization initiators to the suspension of styrene monomer in

water no additional styrene monomer was added at any point during the polymerization of WICHER, contrary to what is alleged by the Examiner. The only chemical which was added during the polymerization (before raising the temperature to the higher temperature) was suspending agent for the already formed polystyrene beads, i.e., sodium dodecylbenzenesulfonate in water.

At any rate, given the fact that according to WICHER the polymerization at the second (higher) temperature is to complete the decomposition of the organic peroxide initiators in the suspension and to provide complete polymerization of the styrene monomer (see, e.g., col. 3, line 66 to col. 4, line 3 of WICHER), it would clearly not make any sense to add fresh unpolymerized styrene monomer before this polymerization completion step.

In this regard, Appellants note that the polymerization completion step of WICHER (i.e., the polymerization at higher temperature) may be considered to correspond to the (optional) final step of the method of the present invention which is described, e.g., in Example 1 of the present application (graphically represented above). In particular, as set forth in the paragraph bridging pages 27 and 28 of the present specification, by raising the temperature to 140°C (from 119°C employed in both the first and the second polymerization) and maintaining the beads at this temperature for 2 hours, the remaining monomer was forcibly polymerized to reduce its amount.

4. At page 12, first paragraph, of the Examiner's Answer it is alleged that WICHER teaches "it would have been obvious to carry out the polymerization of styrene monomers taught by [TAKAMASA] in two steps. The motivation to do so would have

been that the two-step process provides advantages such as isolating the polymer beads and segregating them by size prior to a separate impregnation operation. This, in turn, allows for more precise control of bead size which is critical in some polymer molding operations". In this regard, the Examiner's Answer refers to col. 1, lines 57-60 of WICHER. Appellants note that WICHER states in col. 1, lines 48-65:

EPS [Expandable PolyStyrene], as prepared in the suspension process, is in the form of essentially spherical beads with typical diameters of approximately 0.2 mm to 2.0 mm. In order to render the beads "expandable", it is necessary to impregnate the polymer with a blowing agent, most often low molecular weight alkane hydrocarbons like butane, 2-methylbutane, pentane and cyclohexane. EPS can be prepared in a one-step process or a two-step process. The former allows blowing agent impregnation during the polymerization and has the obvious advantage of reduced polymer handling operations. The two-step process isolates the polymer beads and segregates by size prior to a separate impregnation operation. The advantage in this case is that of precise control of bead size, a more critical parameter in some polymer molding operations. Peroxide initiator concentrations used to expedite conversion in the present invention may readily be adjusted by one of ordinary skill in the art to accommodate either process.

The Examiner appears to (incorrectly) suggest that the above passage of WICHER teaches that only with the two-step process is it possible to isolate the polymer beads and segregate them by size prior to a separate impregnation operation.

Appellants submit that one of ordinary skill in the art will understand that the isolation and segregation by size prior to an impregnation operation with blowing agent is, of course, also possible in the one-step process, provided one is willing to forfeit the advantage of reduced polymer handling operations and impregnates the polymer beads with blowing agent not already during but only after the polymerization, like in the two-step process.

At any rate, the situation is different with the process of TAKAMASA in that in this case not only unpolymerized vinylaromatic monomer but also polyethylene beads are

a starting material and a size separation of the beads which are to be impregnated with the monomer can be carried out already before any impregnation with, and polymerization of the vinylaromatic monomer inside the beads is conducted. Accordingly, even if one were to assume, *arguendo*, that WICHER teaches a two-step polymerization with the employment of additional monomer between the two polymerization steps and teaches that compared to the one-step process the two-step process has advantages with respect to size separation of the beads, it is not seen that WICHER provides any apparent reason for one of ordinary skill in the art to use this (assumed) technique in the method of TAKAMASA.

5. In the paragraph bridging pages 17 and 18 of the Examiner's Answer it is alleged that both ends of the polymerization temperature range disclosed in the instant claims are "remarkably close" to the upper and lower ends of the temperature ranges recited in the claims of co-pending Application No. 10/540,866, and that the claimed gel content in the instant claims is "very close" to the gel content claimed in Application No. 10/540,866. It further is alleged that "the claimed methods and products appear to be modifications of each other derived from routine experimentation and optimizations" and that "[p]rocessing conditions, such as temperature, are routinely adjusted for reasons such as enhancing speed or reducing cost".

Appellants respectfully submit that while it may be that in cases where no or only a very broad value range for a particular parameter is indicated in a document one of ordinary skill has a reason to conduct experiments in order to find a workable or optimum value range. However, this is not the case here. The value ranges disclosed in Application

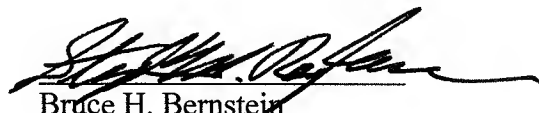
No. 10/540,866 span only a few degrees centigrade and, moreover, are recited in the claims thereof, which is an indication for one of ordinary skill in the art that these ranges were considered important by the inventors of the co-pending application. Accordingly, there is no reason for one of ordinary skill in the art to carry out routine experimentation and optimizations in the present instance.

CONCLUSION

The request to reverse the rejection of claims 1-9 and to return the application to the Examining Group for prompt allowance is respectfully maintained for at least all of the foregoing reasons.

Although no fee is believed to be required for entry of this Reply Brief, the Patent and Trademark Office is hereby authorized to charge any fee that is deemed to be necessary to Deposit Account No. 19-0089.

Respectfully submitted,
Hideyasu MATSUMURA et al.


Bruce H. Bernstein
Reg. No. 29,027

February 11, 2009
GREENBLUM & BERNSTEIN, P.L.C.
1950 Roland Clarke Place
Reston, VA 20191
(703) 716-1191

Stephen M. Roylance
Reg. No. 31,296